

DESIGN CONCEPT REPORT

**ARROYO CHICO GREENBELT
BICYCLE AND PEDESTRIAN SYSTEM**

**KINO PARKWAY
TO
PARKWAY TERRACE**

DESIGN CONCEPT REPORT

**ARROYO CHICO GREENBELT
BICYCLE AND PEDESTRIAN SYSTEM**

**KINO PARKWAY
TO
PARKWAY TERRACE**

Prepared For:

The City of Tucson Department of Transportation

December 3, 2004

Prepared By:

MMLA Psomas, Inc.
800 E. Wetmore Road, Suite 110
Tucson, Arizona 85719
(520) 292-2300

MMLA Project Number 03029-07

CONTENTS

1.0 INTRODUCTION

1.1	Authorization	1
1.2	Location	1
1.3	Existing Conditions.....	1
1.3.1	Roadways.....	1
1.3.2	Signals.....	2
1.3.3	Street Lighting	2
1.3.4	Bicycle and Pedestrian Facilities	2
1.3.5	Transit Services.....	2
1.3.6	Zoning.....	2
1.3.7	Land Uses.....	2
1.3.8	Neighborhood Area Plans	3
1.3.9	Right-of-Way	4
1.3.10	Utilities.....	4
1.3.11	Drainage Facilities	4

2.0 PROJECT DESCRIPTION.....8

3.0 MAJOR DESIGN CRITERIA AND FEATURES

3.1	Design Standards and Criteria	9
3.1.1	Design Standards	9
3.1.2	Design Criteria.....	9
3.2	Horizontal Alignment	10
3.3	Vertical Alignment.....	10
3.4	Pavement Section.....	10
3.5	Access Control	10
3.6	Right-of-Way	10
3.7	Drainage.....	11

3.8	Earthwork.....	11	
3.9	Traffic Control	11	
4.0 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSIDERATIONS			
4.1	Social.....	12	
4.1.1	Schools.....	12	
4.1.2	Parks and Recreational Facilities	12	
4.1.3	Hospitals and Emergency Services.....	12	
4.2	Economic	12	
4.3	Environmental.....	13	
4.3.1	Wildlife	13	
4.3.2	Vegetation.....	13	
4.3.3	Landscape	13	
4.3.4	Soils.....	13	
4.3.5	Erosion	13	
4.3.6	Archaeological and Historical.....	14	
4.3.7	Water, Air and Noise Quality	14	
5.0 ALTERNATIVE DESIGN SOLUTIONS			
5.1	Kino Parkway to Campbell Avenue (Alternatives A and B).....	15	
5.1.1	Alternative A (Bike Path within the Arroyo Chico Concrete Channel)	15	
5.1.2	Alternative B (At-Grade Crossing of Kino Parkway).....	17	
5.2	Campbell Avenue to Parkway Terrace (Alternatives 1 and 2)	18	
5.2.1	Alternative 1 (Greenbelt Pathway)	18	
5.2.2	Alternative 2 (Bike Route Enhancement).....	20	
5.3	Project Cost Estimate Summary	21	
6.0 CONCLUSIONS AND RECOMMENDATIONS			32

LIST OF FIGURES

Figure 1.1: Location Map	6
Figure 1.2: Bike Route Map.....	7
Figure 5.1: Design Alternatives – Aerial Plan View	23
Figure 5.2: Alternative A – Typical Site Plan 200 FT Length.....	24
Figure 5.3: Alternative A – Typical Section Through Bike Path and Landscape Improvements	25
Figure 5.4: Alternative B – Typical Section Through Bike Path and Landscape Improvements at Kino Parkway.....	26
Figure 5.5: Alternative B – Typical Section Through Bike Path and Landscape Improvements at Arroyo Chico	27
Figure 5.6: Alternative 1 – Typical Site Plan 200 FT Length	28
Figure 5.7: Alternative 2 – Bike Route Enhancement Typical Sections	29
Figure 5.8: Alternative 2 – Typical Site Plan 100 FT Length	30
Figure 5.9: Alternative 2 – Typical Section Through Bike Path and Landscape Improvements	31
Figure 6.1: Design Alternatives A and 1 – Aerial Plan View.....	34
Figure 6.2: Design Alternatives A and 2 – Aerial Plan View.....	35
Figure 6.3: Design Alternatives B and 1 – Aerial Plan View	36
Figure 6.4: Design Alternatives B and 2 – Aerial Plan View	37

LIST OF TABLES

Table 5.1: Design Alternatives Cost Summary.....	22
Table 5.2: Design Alternative Combinations Cost Summary.....	22

APPENDICES

APPENDIX A: PROJECT LOCATION PHOTOS

Figure A.1: Beginning of project limits looking west along 15th Street west of Kino Parkway

Figure A.2: Arroyo Chico Wash west of Kino Parkway, looking west to where a ramp into the concrete lined channel would be constructed for Alternative A.

Figure A.3: Arroyo Chico Wash east of Kino Parkway, looking west to Kino Parkway and bridge culvert (5-8'x8').

Figure A.4: Arroyo Chico Wash east of Kino Parkway, looking east to Campbell Avenue and RCBC (4-8'x3').

Figure A.5: Northwest corner of Kino Parkway and 15th Street intersection, looking east across Kino Parkway.

Figure A.6: East side of Kino Parkway, looking east along south side of concrete lined channel.

APPENDIX B: ITEMIZED PROJECT COST ESTIMATES

Table B.1: Alternative A – Kino Parkway to Campbell Avenue
(Bike Path within Arroyo Chico Wash Concrete Channel)

Table B.2: Alternative B – Kino Parkway to Campbell Avenue
(At-Grade Crossing of Kino Parkway)

Table B.3: Alternative 1 – Campbell Avenue to Parkway Terrace
(Greenbelt Pathway)

Table B.4: Alternative 2 – Campbell Avenue to Parkway Terrace
(Bike Route Enhancement)

1.0 INTRODUCTION

1.1 Authorization

The Arroyo Chico Green belt project is an authorized design concept study by the City of Tucson Department of Transportation. The intent of the project is to develop a safe, aesthetically enhanced, and economically feasible pedestrian and bicycle pathway between the Park Avenue Detention Basins project and Parkway Terrace.

1.2 Location

This project is located within Wards 5 and 6 of the City of Tucson, Pima County, State of Arizona, in Sections 17 and 18 of Township 14 South, Range 14 East. The project begins west of Kino Parkway at the Park Avenue Detention Basins project and extends approximately 3,000 feet east to the Arroyo Chico and Parkway Terrace intersection, one block west of Tucson Boulevard. The project crosses Kino Parkway and Campbell Avenue and generally follows the horizontal alignment of the Arroyo Chico Wash, which serves as the northern boundary of the project (see Figure 1.1).

1.3 Existing Conditions

1.3.1 Roadways

Within the project limits, the north/south roadways of concern (crossroads of the proposed bikeway) are Kino Parkway, Campbell Avenue, Norris Avenue, Olsen Avenue, and Plumer Avenue. Kino Parkway is a divided six-lane urban arterial roadway with 12-foot travel lanes and 2-foot shoulders. Campbell Avenue is a three-lane urban collector with 12-foot travel lanes and a 12-foot center lane. Norris Avenue and Plumer Avenue are 38-foot wide two-way residential streets and Olsen Avenue is a 32-foot wide two-way residential street. The east/west roadways of concern (directional roadways the proposed bikeway will follow) are 15th Street, Arroyo Chico, and Parkway Terrace. 15th Street and Arroyo Chico are two-lane urban collectors with 20-foot lanes that accommodate travel and parking. Parkway Terrace is a 32-foot wide two-lane residential street. Kino Parkway, Campbell Avenue, 15th Street and Arroyo Chico are curbed roadways. From Campbell Avenue to Parkway Terrace there are numerous curb cuts and driveway aprons. The quantity of existing curb cuts is greater than that needed for access to existing businesses.

1.3.2 Signals

There currently exists a traffic signal at the Kino Parkway and 15th Street intersection with pedestrian push button facilities (see Appendix A, Figure A.5).

1.3.3 Street Lighting

Three roadways within the project limits provide street lighting; Kino Parkway, Arroyo Chico, and Parkway Terrace.

1.3.4 Bicycle and Pedestrian Facilities

Presently there exists an east/west bike pathway along the north side of 15th Street that terminates west of Kino Parkway. There exist several bike routes that are signed along collector and residential streets from Campbell Avenue to Tucson Blvd. Also, the Arroyo Chico Loop bikeway follows Campbell Avenue to 15th Street and Arroyo Chico (see Figure 1.2 for a map of current bike routes). Therefore, a gap exists between the bikeway to the west of Kino Parkway and the bike routes east of Campbell Avenue. It is the goal of this project to complete the missing link in the system. Existing pedestrian facilities include concrete sidewalks along both sides of Kino Parkway, both sides of Arroyo Chico, and the south side of 15th Street.

1.3.5 Transit Services

Currently, one Sun Tran bus route runs within the project limits. The Campbell Route runs along Kino Parkway and crosses the proposed project location. Five Sun Tran routes, three of which serve Reid Park directly, run in the general project vicinity.

1.3.6 Zoning

Current zoning designations along the project limits are Residential (R-2) and Light Industrial (I-1).

1.3.7 Land Uses

Land uses of the surrounding areas include vacant land, recreational facilities, drainage facilities, residential housing, school facilities, churches and light industrial and storage businesses. Recreational

facilities include Tucson High School's Cherry Field Baseball and Softball facility at the west end of the project and the University of Arizona's Rincon Vista Sports Complex and the Roy P. Drachman Track and Field Stadium located at the southeast end of the project. Residential housing includes the adjacent neighborhood at the northeast end of the project limits along Parkway Terrace and a neighborhood association (Broadmoor-Broadway) located east of the project limits east of Tucson Blvd. Several schools are located in the project vicinity including Robison Elementary School and Howenstine Adaptive Education High School (southeast), Pace Accommodation High School (south) and St. Ambrose Elementary School (north). The Tucson Unified School District utilizes the parcel on the north side of 15th Street between Campbell Avenue and Norris Avenue for bus storage and parking. The Bethel conservative Baptist Church is located on the north side of 15th Street between Olsen Avenue and Plumer Avenue and the Sabbar Temple Corporation is located on the north side of Arroyo Chico at the end of the project between Parkway Terrace and Tucson Blvd. Several light industrial parcels are located along 15th Street including businesses such as Spray Master Auto Body and Paint, Inc. and WTI, Inc.

1.3.8 Neighborhood Area Plans

According to the Final Design Concept Report, *Bicycle Path and Bicycle/Pedestrian Overpass at Kino Parkway and Arroyo Chico Wash*, by Parsons Brinckerhoff in February 1994, the project is in the *Arroyo Chico Area Plan* adopted by the Mayor and Council in March 1986. The area east of Kino Parkway is also identified within the *Arroyo Chico Area Plan: Industrial Area 2*. Two specific goals identified in the *Arroyo Chico Area Plan* that directly effect this project are:

1. Promote the preservation and maintenance of linear open spaces along the Arroyo Chico Wash as a natural unifying feature of the area, and
2. Protect neighborhoods from truck traffic and roadway improvements, while allowing industrial and business access to key transportation routes.

For further discussion of the goals of the *Arroyo Chico Area Plan*, see the *Arroyo Chico Grade Separation Demonstration Project Planning Report* prepared by the City of Tucson in August 1992.

1.3.9 Right-of-Way

The existing right-of-ways within the project limits are as follows:

Kino Parkway:	150 feet
Campbell Avenue:	60 feet
15 th Street and Arroyo Chico:	60 feet
Arroyo Chico Wash:	50 feet

1.3.10 Utilities

Existing utilities are primarily concentrated within the Campbell Avenue right-of-way. Known facilities include underground water, sewer, and gas, and overhead electric power and cable television.

1.3.11 Drainage Facilities

Existing drainage facilities within the project limits aid to drain the Arroyo Chico Wash. The wash drains from east to west and generally runs parallel to Arroyo Chico and 15th Street. The wash is maintained as a natural wash from Tucson Blvd to Campbell Avenue with low water crossings at Parkway Terrace, Plumer Avenue, Olsen Avenue, and Norris Avenue. There presently exist drainage culverts under Campbell Avenue and under Kino Parkway. A reinforced concrete box culvert (RCBC) drains the wash under Campbell Avenue. The RCBC is four cells wide and sixty feet long where each cell is eight feet in width and three feet in height (4-8'x3'x60') (see Appendix A, Figure A.3). The RCBC drains the Arroyo Chico Wash into a concrete lined channel with a vertical elevation drop of four feet. A bridge culvert drains the concrete lined wash under Kino Parkway. The bridge culvert is five cells wide and two-hundred-fifty feet long where each cell is eight feet in width and eight feet in height (5-8'x8'x250') (see Appendix A, Figure A.4).

The concrete lined channel begins at Campbell Avenue and continues to the west under Kino Parkway (see Appendix A, Figure A.2). The side walls west of Kino Parkway are sloped at 2:1 and the side walls from Kino Parkway to Campbell Avenue are vertical. Along the Arroyo Chico Wash from Fremont Avenue to Parkway Terrace, a future project is in design that includes channel improvements

and a new detention basin. The United States Army Corps of Engineers, the Pima County Flood Control District, and the City of Tucson jointly sponsor the Park Avenue Detention Basins project.



Scale: 1"=1000'

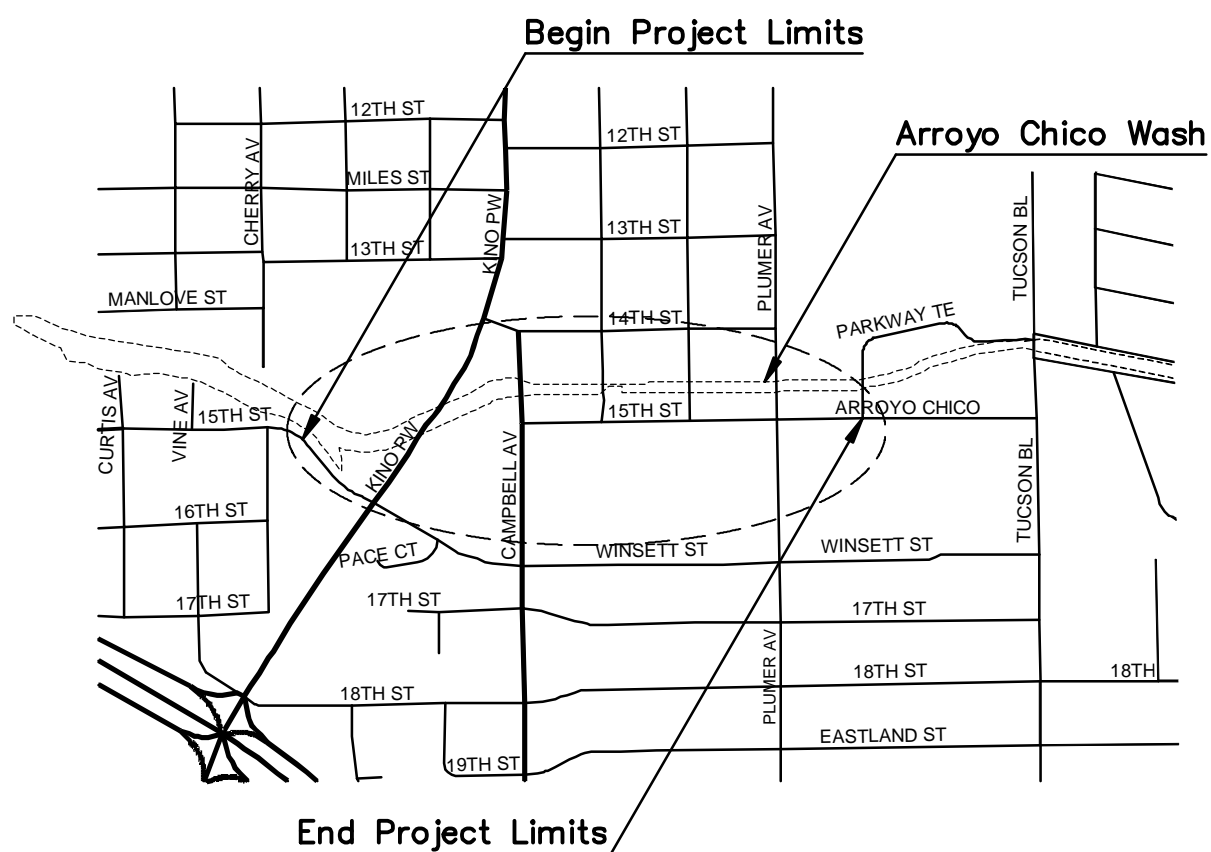
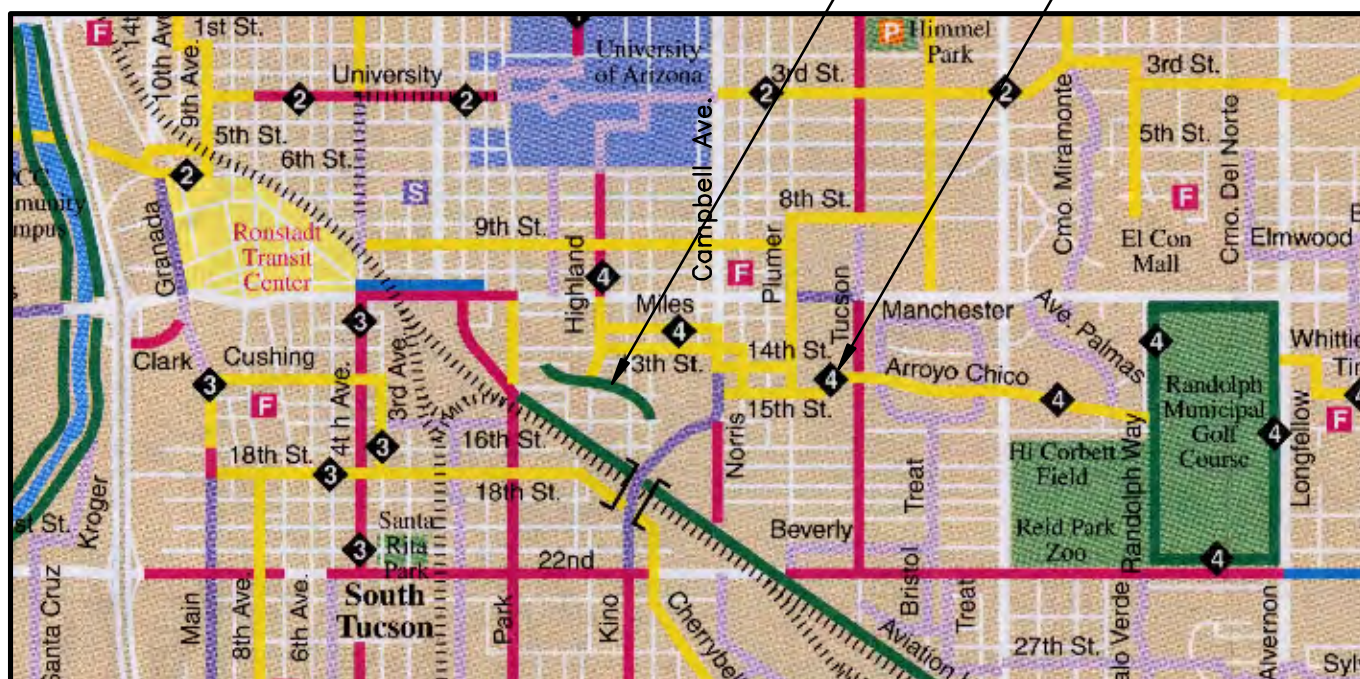


FIGURE 1.1
Location Map



Existing Bike Pathway

Existing Bike Routes



4 Arroyo Chico Loop

FIGURE 1.2
Bike Route Map

2.0 PROJECT DESCRIPTION

Currently, a gap exists between the existing bikeway to the west of Kino Parkway and the existing bike routes east of Campbell Avenue. It is the goal of this project to complete the missing link in the bicycle and pedestrian system. The intent of this project, therefore, is to develop a safe, aesthetically enhanced, and economically feasible bicycle and pedestrian connection from the existing bike pathway located west of Kino Parkway to the existing bike route at Parkway Terrace, one block west of Tucson Blvd. Two sets of alternatives and four options or combinations of alternatives will be discussed in Sections 5.0 and 6.0 of this document.

3.0 MAJOR DESIGN CRITERIA AND FEATURES

3.1 Design Standards and Criteria

3.1.1 Design Standards

Tucson Department of Transportation (TDOT) Engineering Division:

- Active Practices Guidelines (APG), 2002.

City of Tucson (COT) and Pima County Department of Transportation (PCDOT):

- Standard Details for Public Improvements, 2003.
- Standard Specifications for Public Improvements, 2003.
- Pavement Marking Design Manual, 2002.
- Traffic Signing Design Manual, 2002.

American Association of State Highway and Transportation Officials (AASHTO):

- A Policy on Geometric Design of Highways and Streets (Green Book), 2001.
- Guide for the Development of Bicycle Facilities, 1991.

Federal Highway Administration:

- Manual on Uniform Traffic Control Devices, 2003.

Tucson Water:

- Tucson Water System Modification Design and Drafting Guidelines, 2002.

3.1.2 Design Criteria

Bike Path Width: 10 feet

Bike Lane Width: 5 feet

Pavement Section: Bike Pathway - AC=3"

Bike Lane – to match existing roadway pavement section

Curb: PC/COT Standard Detail 209 Type 2, h=8"

Maximum Bike Path Gradient: 5%

3.2 Horizontal Alignment

The horizontal alignment will generally follow the Arroyo Chico Wash alignment, whether within the existing concrete channel, within the designated green belt, or along the existing roadways. The west terminus point (project beginning) matches the existing bike pathway and the east terminus point (project end) matches the bike route at Parkway Terrace. See Figure 5.1 for a plan view of the project and the various alternatives (see Section 5.0 for a discussion of the alternatives and alternative combinations).

3.3 Vertical Alignment

The vertical alignment will follow existing grades throughout the project limits, whether at surface grade, pavement grade, or channel grade. If Alternative A is selected, the Army Corps of Engineers will construct ramps into and out of the concrete lined channel as part of the Park Avenue Detention Basins project.

3.4 Pavement Section

If a bike pathway is utilized, the pavement section will be 3 inches of AC on compacted subgrade. If a bike lane is utilized and widening of the existing roadway is required, the pavement section will match the existing roadway pavement section. For purposes of estimating, a section of 4 inches of AC on 6 inches of AB on compacted subgrade will be used. No geotechnical investigation or pavement design will be required for this project.

3.5 Access Control

The bicycle route will have no access controls or constraints.

3.6 Right-of-Way

Preliminary investigations show that a bicycle and pedestrian route can be constructed within the City of Tucson right-of-way. Temporary construction easements may be required at some locations due to physical constraints. However, an aspect of this study is to evaluate alternatives and the corresponding requirement of new right-of-way. Preliminary right-of-way needs will be determined for all design

alternatives developed in this DCR. Sections 5.0 and 6.0 will discuss in detail the various right-of-way requirements for each alternative. Final right-of-way plans are beyond the scope of this report.

3.7 Drainage

It is not anticipated that the proposed bicycle and pedestrian facilities will create any adverse effects to the existing drainage patterns. Other than very minor additional runoff from newly constructed pavement surfaces and adjacent landscaped slopes, there will be no impacts or alterations to the existing drainage system. A drainage report will not be developed as part of this project.

3.8 Earthwork

Earthwork for this project will consist primarily of grading existing soil and roadway subgrade surfaces. Large earthwork equipment is not anticipated to be required.

3.9 Traffic Control

The need to maintain a safe and continual flow of traffic at all times through the construction zone is a very important aspect of any improvement project along a roadway. It will be the responsibility of the Contractor to submit a general traffic control plan at the time of construction following the guidelines set forth in the Manual on Uniform Traffic Control Devices, 2003.

4.0 SOCIAL, ECONOMIC, AND ENVIRONMENTAL CONSIDERATIONS

4.1 Social

As mentioned under Section 1.3, Existing Conditions, several schools and parks are in the project vicinity. Therefore, the provision of a completed system of bicycle and pedestrian facilities seems to be a crucial element in terms of social considerations.

4.1.1 Schools

The project limits are within the Tucson Unified School District and include the following public schools in the area: Robison Elementary School, Pace Accommodation High School, and Howenstine Adaptive Education High School. St. Ambrose, a private elementary school, is also in the vicinity of the project.

4.1.2 Parks and Recreational Facilities

Tucson High School's Cherry Field baseball and softball facility is located at the west end of the project limits, west of Kino Parkway. The University of Arizona's Rincon Vista Sports Complex and the Roy P. Drachman Track and Field Stadium are located at the southeast end of the project limits along Arroyo Chico. Reid Park is located one mile east of the project.

4.1.3 Hospitals and Emergency Services

The University Medical Center is located one and a half miles north of the project on Campbell Avenue. The City of Tucson provides all emergency services in the project vicinity.

4.2 Economic

Although this project is expected to have recreational benefits for the area residents and assist in providing safer access to nearby schools for school children, the project is not expected to have major economic impacts.

4.3 Environmental

4.3.1 Wildlife

Based on the *Final Design Concept Report for Bicycle Path and Bicycle/Pedestrian Overpass at Kino Parkway and Arroyo Chico Wash*, February 1994, by Parsons Brinckerhoff, and the *Environmental Assessment for the Park Avenue Detention Basins project* by the U.S. Army Corps of Engineers, there are no records of special status species for this site.

4.3.2 Vegetation

The project limits encompass several developed parcels with existing industrial, commercial, and/or residential land uses. Most parcels along the project limits have been cleared and, in some instances, paved. There is very little existing vegetation within the subject area. Existing vegetation is generally limited to plants growing along the Arroyo Chico Wash and landscaped vegetation within residential parcels. There is no vegetation within the concrete lined channel of the Arroyo Chico Wash, but there is desert vegetation growing along the outer edges of the concrete channel and also within the naturally maintained wash from Campbell Avenue to Tucson Blvd.

4.3.3 Landscape

Landscaped areas include the streetscape along Kino Parkway and Arroyo Chico. The parcel at the northwest corner of the Kino Parkway and 15th Street intersection comprises a statue (Father Kino) and desert plant landscaping.

4.3.4 Soils

A subsurface study was not required as part of this project and it is assumed that the soil characteristics are of good quality for the construction activities proposed.

4.3.5 Erosion

Areas that are disturbed as part of any construction activity shall be compacted and re-vegetated.

4.3.6 Archaeological/Historical

Based on the Parsons Brinckerhoff 1994 DCR, and the Park Avenue Detention Basins project environmental assessment, there are no known archaeological sites in the project vicinity.

4.3.7 Water, Air, and Noise Quality

It is not anticipated that there will be any adverse effects to water, air, or noise quality due to the construction of this project.

5.0 ALTERNATIVE DESIGN SOLUTIONS

The discussion of alternative designs has as its goal the development of a safe, aesthetically enhanced, and economically feasible bicycle and pedestrian connection between the Park Avenue Detention Basins project and Parkway Terrace. Alternatives A and B focus on the first half of the project area from the Park Avenue Detentions Basins project west of Kino Parkway to Campbell Avenue. Alternatives 1 and 2 focus on the second half of the project area from Campbell Avenue to Parkway Terrace. See Figure 5.1 for a plan view of all the alternatives.

5.1 Kino Parkway to Campbell Avenue (Alternatives A and B)

Currently, bicycle and pedestrian traffic traveling from Cherry Avenue to Campbell Avenue must utilize incomplete pedestrian and bicycle friendly facilities. Pedestrian and bicycle traffic from Cherry Avenue uses an existing paved pathway along the north side of 15th Street. West of Kino Parkway, the pathway ends and pedestrian and bicycle traffic must merge onto 15th Street and cross Kino Parkway at the signalized intersection. East of Kino Parkway, pedestrians and bicycles must continue traveling along Winsett Street to reach Campbell Avenue. Presently Winsett Street does not facilitate either pedestrian or bicycle traffic with sidewalks or bike lanes. The intentions of Alternatives A and B are to help facilitate safe pedestrian and bicycle traffic from the existing bicycle pathway to Campbell Avenue.

5.1.1 *Alternative A – Bike Path within the Arroyo Chico Concrete Channel*

Alternative A serves as a below-grade bike pathway that utilizes the existing concrete lined Arroyo Chico Wash channel and the existing bridge culvert. Concrete ramps into and out of the concrete lined channel could be constructed as part of the Park Avenue Detention Basins project prior to the construction of this project, one west of Kino Parkway and one west of Campbell Avenue. Bicycle and pedestrian traffic would slope down into the concrete channel using the first ramp, travel on the existing concrete lined channel under Kino Parkway and through the existing bridge culvert, and slope up to Campbell Avenue using the second ramp.

Construction of the proposed bicycle path within the concrete lined Arroyo Chico channel would limit the opportunities for new landscape development. No new amenity landscaping is proposed. Construction of the proposed ramps and bicycle paths east and west of Kino Parkway may result in the removal of protected native plant specimens. To comply with the requirements of the City of Tucson Native Plant Preservation Ordinance, mitigation plantings may be required. The scope of the required mitigation planting will be established during the design stages, after the final path alignments and limits of disturbance have been identified. Mitigation plantings should be installed at areas of the site where new irrigation systems will be installed or where existing irrigation systems are present. A site plan sketch and a cross-section sketch of this alternative are presented in Figures 5.2 and 5.3, respectively.

Although this alternative may be safer in terms of avoiding all interactions with Kino Parkway car and truck traffic, other safety issues arise. For one, bicycle and pedestrian traffic during the night hours will be beyond any existing lighting benefits. Second, traffic will be below and away from the existing roadways and public visual contact in terms of security will be lacking. Therefore, lighting and security measures will need to be provided which will increase costs. Third, maintenance of the channel bottom would be needed to provide a smooth surface for bicycle traffic, particularly after storm events. Continual maintenance would also increase costs.

Another constraint with this alternative is the ramp from the concrete lined channel to grade. It would be ideal for the pedestrian and bicycle traffic to travel under Campbell Avenue before ramping to grade. The current 4-foot drop-off on the west side of Campbell Avenue from the 4-8'x3' RCBC into the concrete lined channel presents a constraint in terms of crossing Campbell below grade. The RCBC will be modified per the Park Avenue Detention Basins project but will not improve the existing vertical elevation drop to allow traffic to travel through the RCBC. Therefore, a ramp is required on the west side of Campbell Avenue to bring pedestrian and bicycle traffic to grade.

5.1.2 *Alternative B – At-Grade Crossing of Kino Parkway*

Alternative B is an at-grade bike pathway that utilizes the existing traffic signal at the Kino Parkway and 15th Street intersection and the undeveloped right-of-way (30-foot swath) on the south side of the concrete lined channel. Bicycle and pedestrian traffic will continue to travel east along the north side of 15th Street on an extension of the existing bike pathway, cross Kino Parkway at the signalized intersection, travel north along Kino Parkway on a new bike pathway (approximately 470 feet to the concrete channel), and travel east on a new off-street bike pathway to Campbell Avenue.

To the greatest extent possible, the existing landscape improvements within the Kino Parkway right-of-way and along the south bank of the Arroyo Chico will be preserved in place. The pathway along the south side of the Arroyo Chico Wash will need additional clearing and grubbing in order to provide the necessary safety and sight distance along the corridor. The construction of the proposed bicycle pathway may result in the removal of a few protected native plant specimens. To comply with the requirements of the City of Tucson Native Plant Preservation Ordinance, mitigation plantings may be required. The scope of the required mitigation planting will be developed during the design stages after the final alignments have been established and limits of disturbance have been identified.

It is proposed that mitigation plantings be installed in an area close to the Kino Parkway right-of-way so that the existing Kino Parkway irrigation system can be extended to irrigate the subject plants. If possible, the irrigation system proposed as part of this alternative will involve a connection to, and extension of, the existing Kino Parkway right-of-way irrigation system. Due to the limited scope of the proposed landscape improvements, this approach is practical and cost effective. A final determination in this regard will be contingent upon a review of the current condition and capacity of the existing Kino Parkway irrigation system. If the existing system cannot be expanded, a new irrigation system consisting of a new water service and meter, backflow preventer, controller, control valves, piping, and drip emitters will be required.

The bicycle pathway will be asphalt and located adjacent to the existing sidewalk. The pathway will be 10 feet wide and striped for two 5-foot bicycle lanes. Between Kino Parkway and Campbell Avenue, the pathway will be 15 feet wide and striped for two 5-foot bicycle lanes and one 5-foot

pedestrian lane. Decomposed granite surfacing or other aggregate surfacing will be installed in areas adjacent to the proposed bicycle path to provide dust and erosion control. Cross-section sketches of this alternative are presented in Figures 5.4 and 5.5, respectively.

The primary advantage to this alternative is the utilization of the existing safety features; i.e. traffic signal, pedestrian push buttons, crosswalks, street lighting and public visibility. There will be some reconstruction of the curb and sidewalk along 15th Street west of Kino Parkway to develop a pedestrian and bicycle friendly pathway. As the pathway crosses the 15th Street cross culvert west of Kino Parkway, improvements will be required. The least expensive would be to construct a concrete barrier between the pathway and the street as well as eliminate the parking turnout just west of the intersection (See Appendix A, Figure A.5). A more expensive option to create space for the pathway would be to extend the culvert approximately five feet. A third option would be to construct a new pedestrian bridge over the culvert. All options should be considered during the design stages, but for purposes of cost estimating for this Design Concept Report (DCR) the most economical option will be considered which is to construct a concrete barrier and eliminate the parking turnout.

5.2 Campbell Avenue to Parkway Terrace (Alternatives 1 and 2)

5.2.1 Alternative 1 – Greenbelt Pathway

Alternative 1 assumes that substantial funding for acquiring new right-of-way is available. The objective of this alternative is to create an extensive re-vegetated open space green belt by acquiring the fifteen (15) parcels along the north side of 15th Street and Arroyo Chico from Campbell Avenue to Parkway Terrace. The proposed green belt will be approximately 1,750 feet long and 150 feet wide. The pathway will be located between the Arroyo Chico Wash and 15th Street/Arroyo Chico. The 150-foot wide swath of land will allow for the design and construction of a safe and aesthetically pleasing off-street asphaltic bicycle and pedestrian pathway.

The bicycle pathway will be 10 feet wide and striped for two 5-foot bicycle lanes. A separate pedestrian walkway may be a desirable feature to include with this alternative. The pedestrian pathway would be 5-feet wide and either asphalt or compacted decomposed granite. Both pathways will meander through an extensive, re-vegetated landscaped area. The bicycle and pedestrian

pathways would be adjacent to one another. The at-grade crossing of Campbell Avenue would occur just south of the Arroyo Chico Wash crossing. For safety reasons, the bicycle path will cross the intersecting streets (Norris Street, Olsen Street, and Plumer Avenue) immediately north of their intersections with 15th Street.

The landscape improvements proposed will include trees, shrubs, and decomposed granite surfacing. Emphasis will be given to trees to provide visual enhancement for the surrounding community and to improve the habitat values associated with the adjacent Arroyo Chico Wash. Shrubs will be used on a limited basis and will be planted in areas where sight lines are important to user safety. Decomposed granite surfacing will be installed for dust control. A site plan sketch of this alternative is presented in Figure 5.6.

This alternative will not result in the removal of protected native plants as defined by the City of Tucson Native Plant Preservation Ordinance. Plant salvage and mitigation work will not be required.

A new automatic drip irrigation system will be installed and will be in accordance with City of Tucson Department of Transportation standards. Tucson Water is currently in the process of constructing a reclaimed water line to the area for use in the Park Avenue Detention Basin project, which can be utilized for irrigation as a part of this project.

In addition to landscape plantings, other appropriate site amenities such as benches, shade structures, and trash receptacles can be included as part of this alternative.

Since the bicycle and pedestrian traffic will be crossing Campbell Avenue from the Arroyo Chico Wash channel area to an open area bike pathway with two-way traffic, one at-grade crossing will be required. The at-grade crossing at Campbell Avenue will include striping and signing and possibly signalization.

5.2.2 *Alternative 2 – Bike Route Enhancement*

Alternative 2 assumes that funding for acquiring new right-of-way is limited. The objective of this alternative is to improve 15th Street and Arroyo Chico with the construction of bike lanes and sidewalks. There are several possibilities that could be accomplished with this alternative. 15th St, which becomes Arroyo Chico, is a 40-foot wide roadway that allows parking on both sides of the roadway. The roadway can be re-stripped and re-signed with two 11-foot travel lanes, two 5-foot bike lanes, and one 8-foot parking area on the south side of the street (see Figure 5.7 Section A). The roadway could also be widened three (3) feet symmetrically which would allow for parking on both sides of the street. The striping would include two 10-foot travel lanes, two 5-foot bike lanes, and two 8-foot parking areas (see Figure 5.7, Section B).

Along with new striping and signing, additional roadway improvements are proposed. If Section A is utilized, construction of new sidewalk and new driveway aprons are proposed for both sides of the street. If Section B is utilized, additional pavement, new curb, new sidewalk, and new driveway aprons are proposed for both sides of the street.

The roadway can be widened within the existing right-of-way, but the cost would increase due to the removal and replacement of pavement and curb. Since two-way bicycle and pedestrian traffic will be crossing Campbell Avenue onto the 15th Street one-way bike lanes, an at-grade crossing will be required at the Campbell Avenue and 15th Street intersection. The crossing is required to move WB traffic from the north side of 15th Street across Campbell Avenue to the wash route (Alternatives A and B) and to move EB traffic from the wash route across Campbell Avenue to the south side of 15th Street. Striping and signing will be required with the possibility of signalization.

The landscape improvements proposed for this alternative include tree and shrub plantings within the existing right-of-way along the north side of 15th Street. Trees will be located to avoid conflicts with sight-visibility triangles at street intersections and to avoid conflicts with underground utilities. Decomposed granite is also proposed within planted areas for dust control.

A new automatic drip irrigation system will be installed and will be in accordance with City of Tucson Department of Transportation standards. Tucson Water is currently in the process of constructing a reclaimed water line to the area for use in the Park Avenue Detention Basin project, which can be utilized for irrigation as a part of this project.

This alternative would provide a very functional continuation of the existing bike routes in the project vicinity. The alternative would promote bicycle safety in terms of bike lanes and pedestrian safety in terms of sidewalks while keeping with the corridor's need for on-street parking. There would be no need for right-of-way acquisition, although construction easements may be required. Roadway improvements required will be flexible to correspond to available construction funding. The at-grade crossing of Campbell Avenue will occur south of the Arroyo Chico Wash at the Campbell Avenue and 15th Street intersection. Crosswalks will be required on both sides of 15th Street crossing Campbell Avenue. A site plan sketch and a cross-section sketch of this alternative are presented in Figures 5.8 and 5.9, respectively.

5.3 Project Cost Estimate Summary

No specific budget has been established for construction at the present time. Funding for this project, therefore, is unknown at this time and will be determined sometime after the completion of the DCR. Itemized preliminary cost estimates for each alternative are provided in Appendix B. See above subsections for discussions regarding each alternative. A summary of the expected project costs for the individual alternatives is provided in Table 5.1.

TABLE 5.1
Design Alternatives Cost Summary

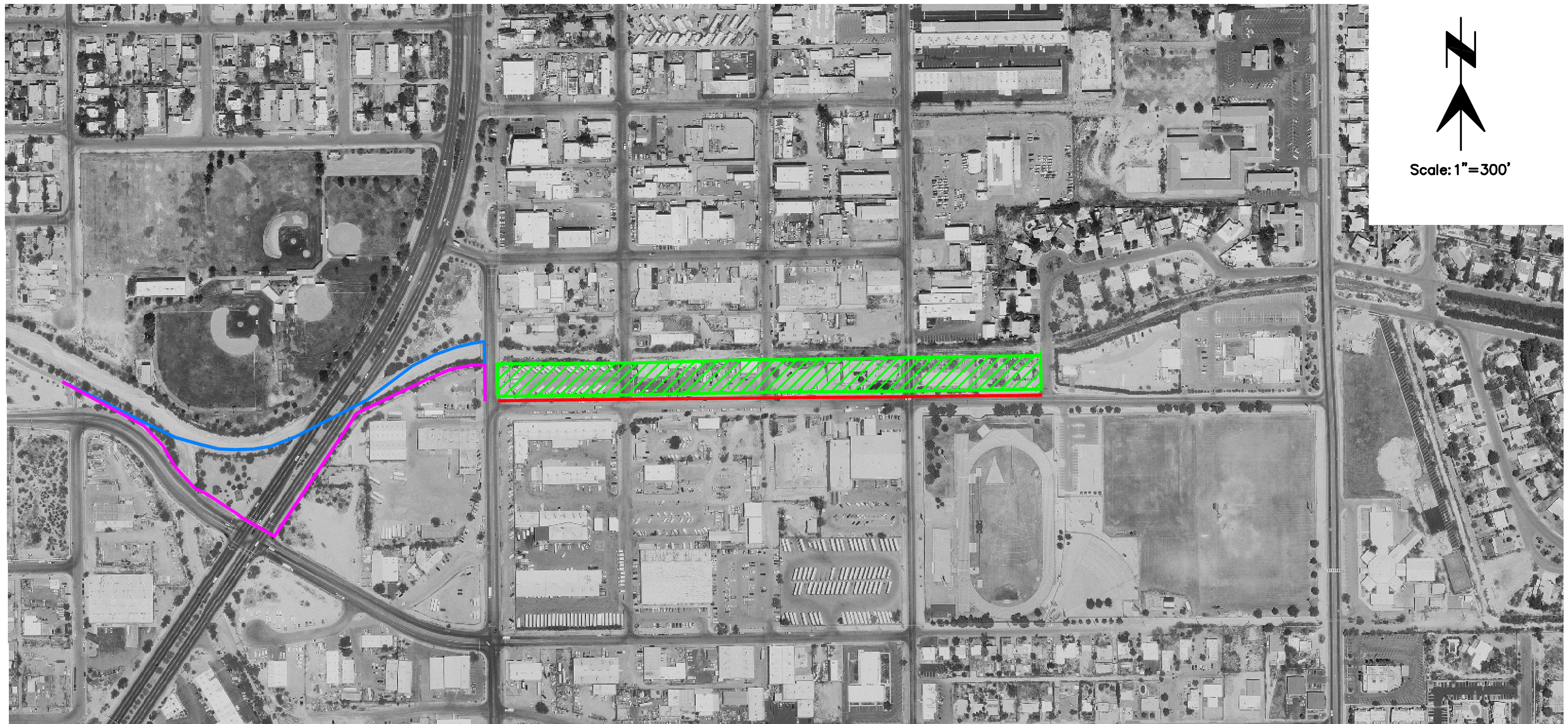
ALTERNATIVE	DESCRIPTION	COST
A	Kino Parkway to Campbell Avenue (*Bike Path within Arroyo Chico Wash Concrete Channel)	\$ 93,702
B	Kino Parkway to Campbell Avenue (At-Grade Crossing of Kino Parkway)	\$ 182,888
1	Campbell Avenue to Parkway Terrace (Greenbelt Pathway)	\$ 2,907,807
2	Campbell Avenue to Parkway Terrace (Bike Route Enhancement)	\$ 375,935

* Additional costs may be incurred for the maintenance of the bike path within the concrete lined channel.

A summary of the expected project costs for the combinations of alternatives is provided in Table 5.2.

TABLE 5.2
Design Alternative Combinations Cost Summary

DESCRIPTION	COST
Combination A & 1 Total Cost – Concrete Channel Path and Greenbelt	\$ 3,001,509
Combination A & 2 Total Cost – Concrete Channel Path and Bike Route	\$ 469,637
Combination B & 1 Total Cost – At-Grade Path and Greenbelt	\$ 3,090,695
Combination B & 2 Total Cost – At-Grade Path and Bike Route	\$ 558,823



Alternative 1 - Greenbelt/Right-of-Way Take



Alternative 2 - Bike Lane/Bike Path



Alternative A - Bike Path Below Pvmnt Grade in Concrete Channel



Alternative B - Bike Path at Pvmnt Grade

FIGURE 5.1

Design Alternatives

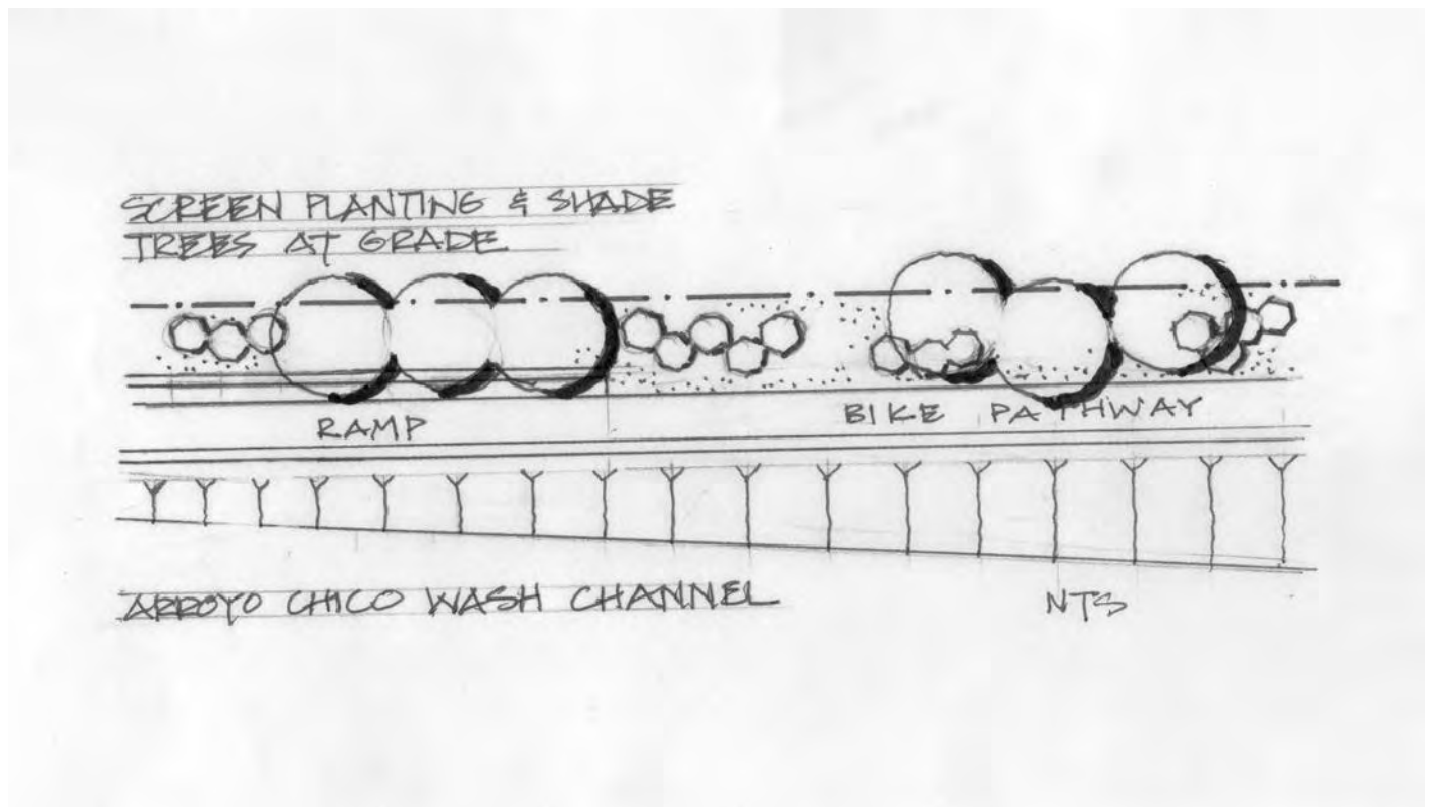


FIGURE 5.2
Alternative A

Typical Site Plan 200 FT Length

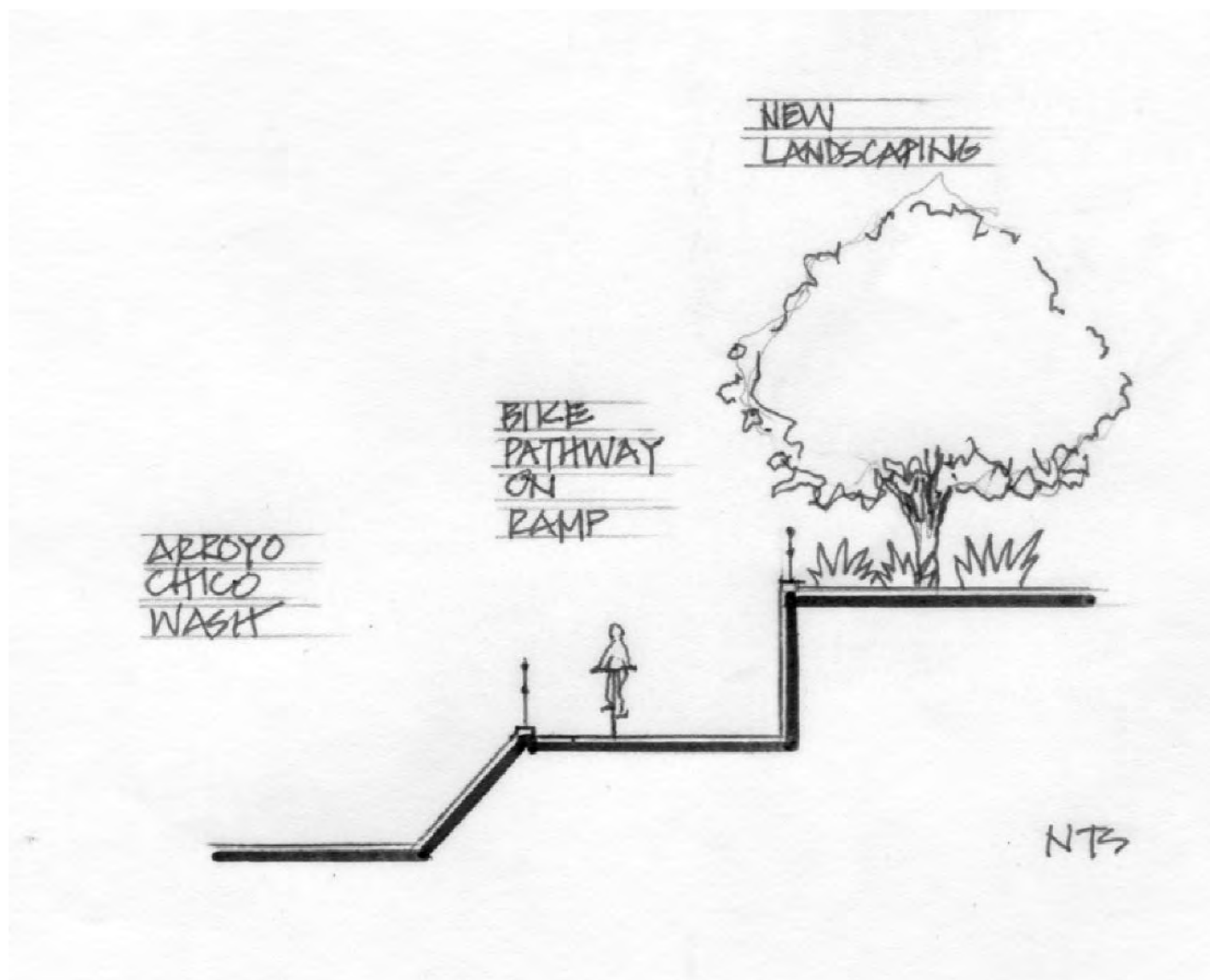


FIGURE 5.3
Alternative A
Typical Section Through Bike
Path and Landscape Improvements

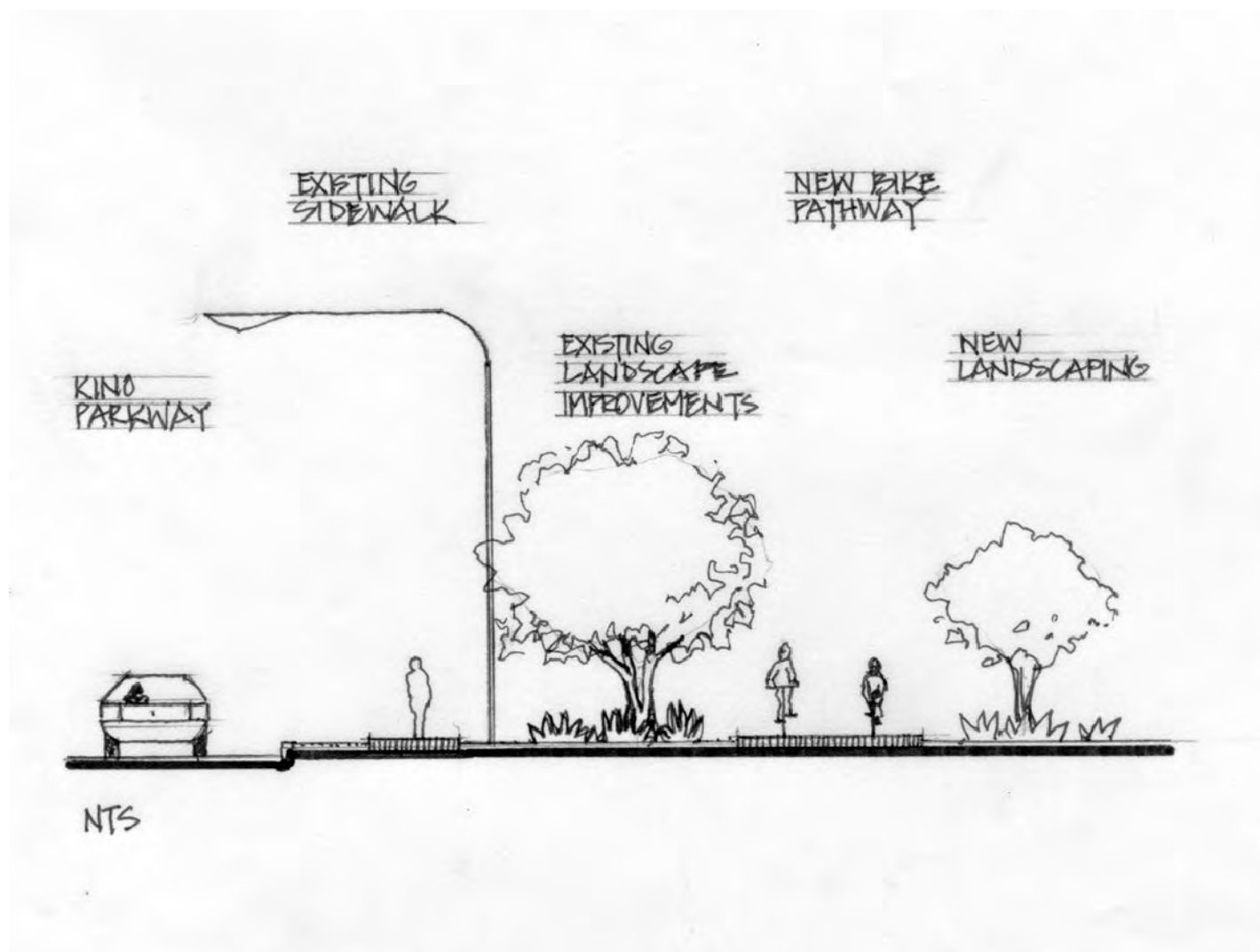


FIGURE 5.4

Alternative B

Typical Section Through Bike Path
and Landscape Improvements
at Kino Parkway

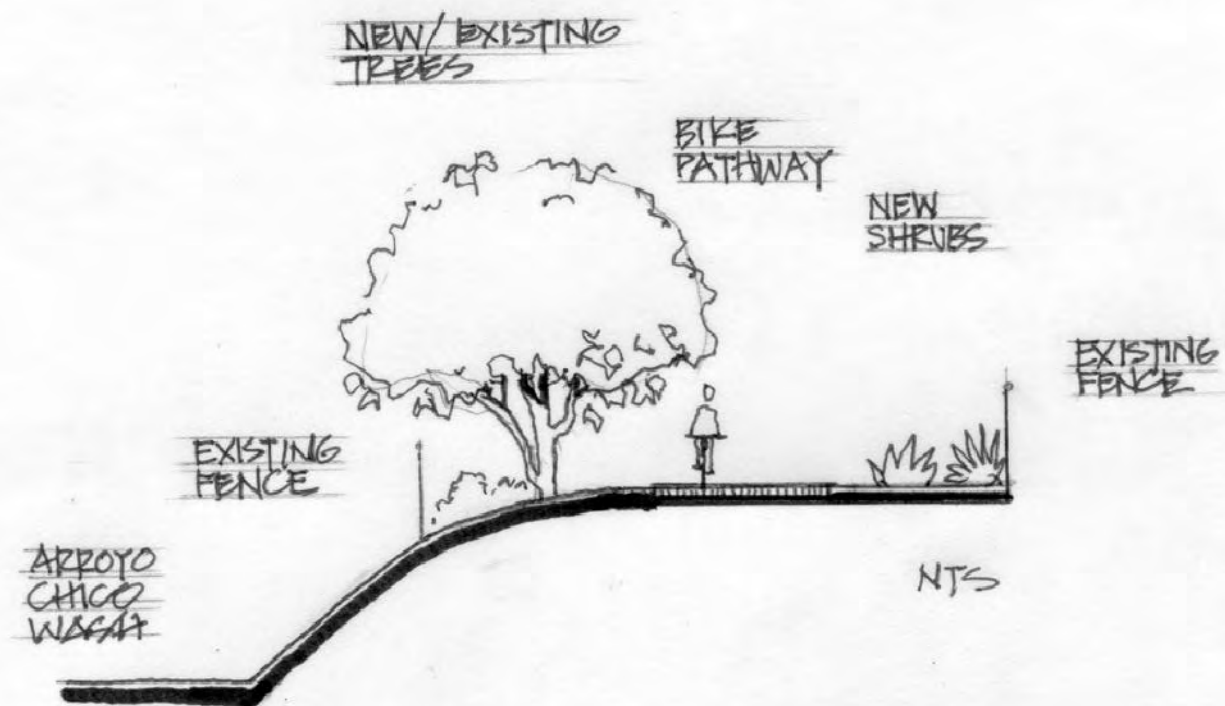


FIGURE 5.5

Alternative B

Typical Section Through Bike Path
and Landscape Improvements
at Arroyo Chico

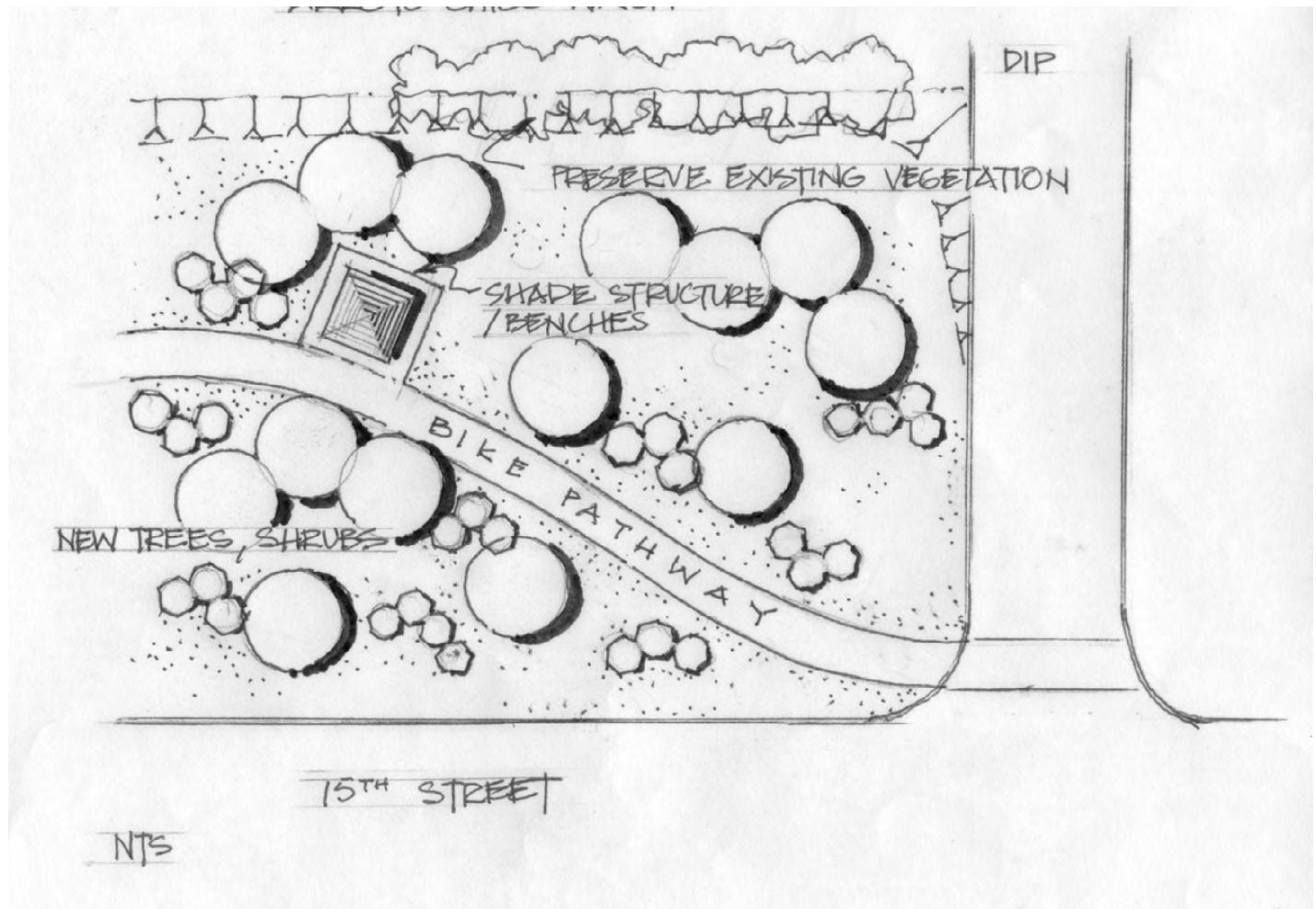
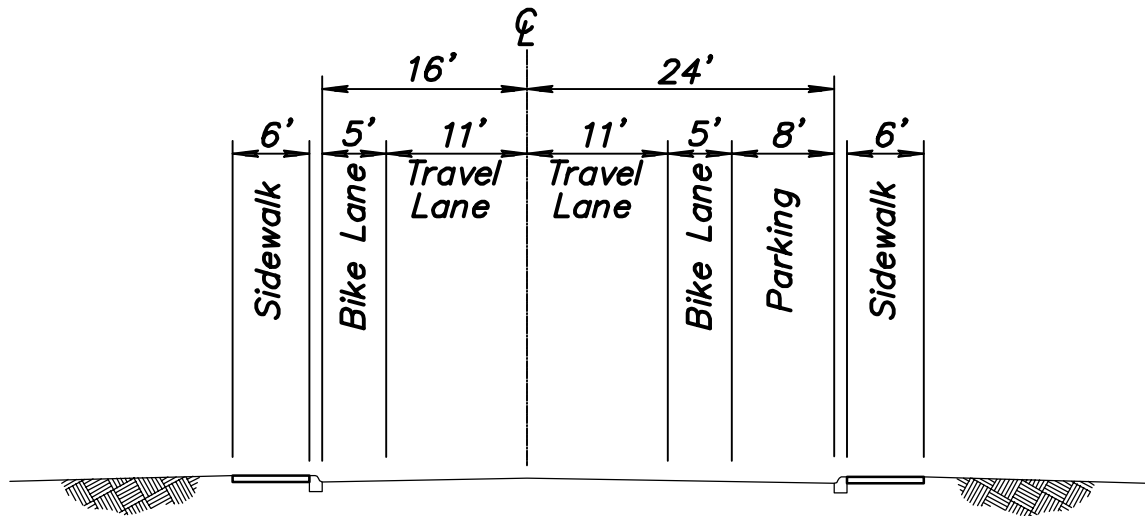
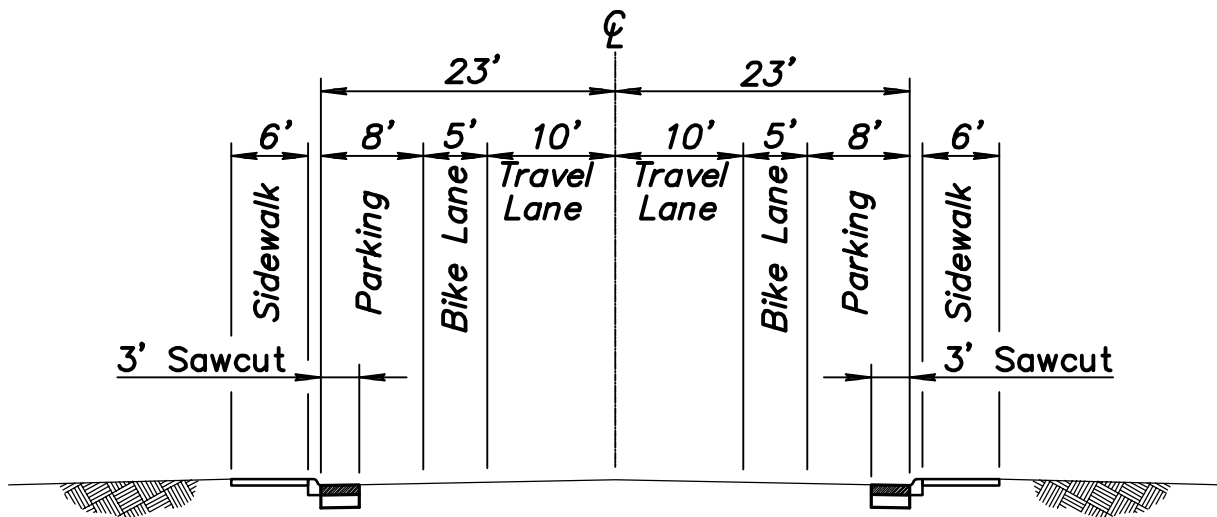


FIGURE 5.6
Alternative 1

Typical Site Plan 200 FT Length



Section A
Campbell Ave to Parkway Terrace
 NTS



Section B
Campbell Ave to Parkway Terrace
 NTS

FIGURE 5.7
Alternative 2
Bike Route Enhancement
Typical Sections

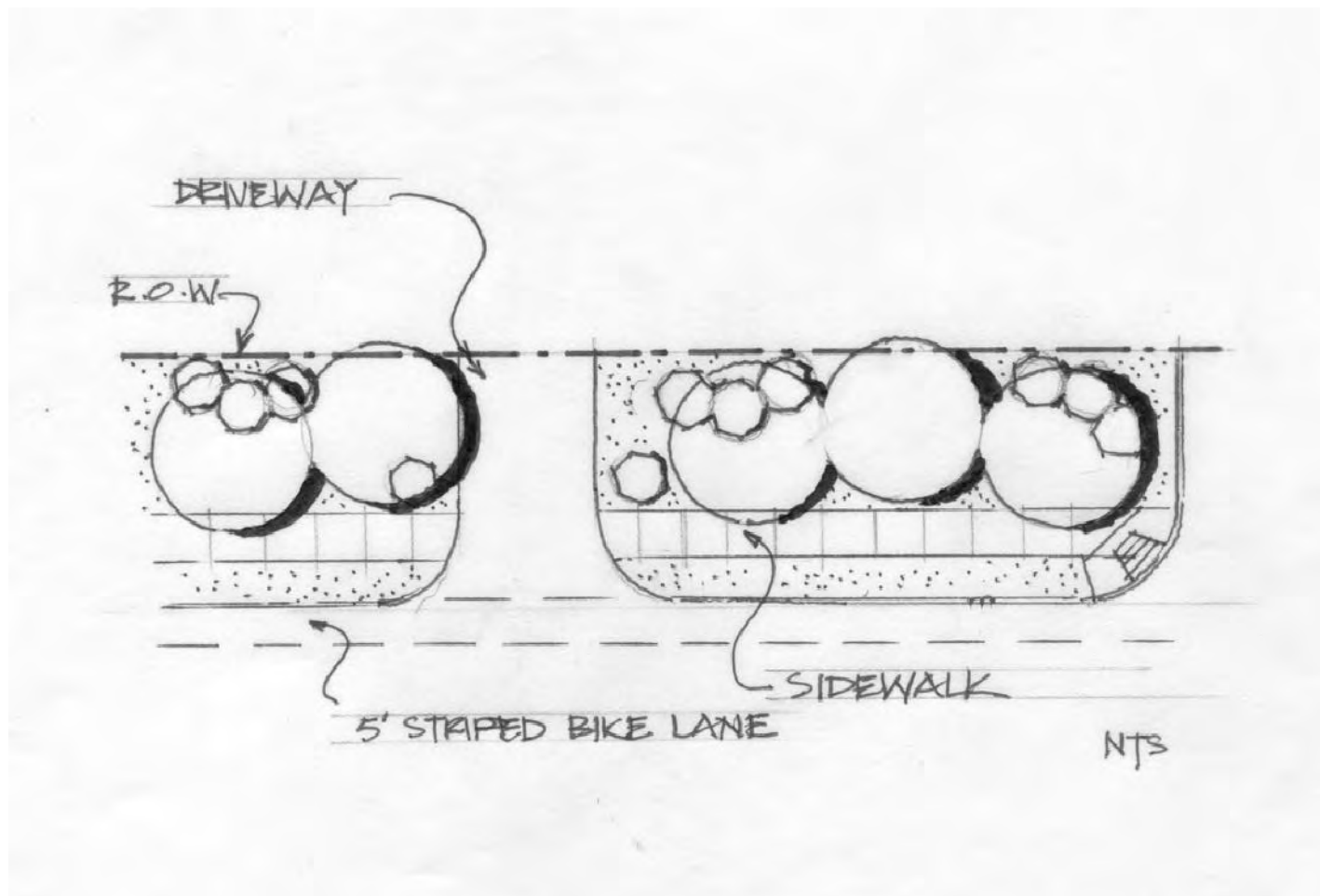


FIGURE 5.8
Alternative 2
Typical Site Plan 100 FT Length

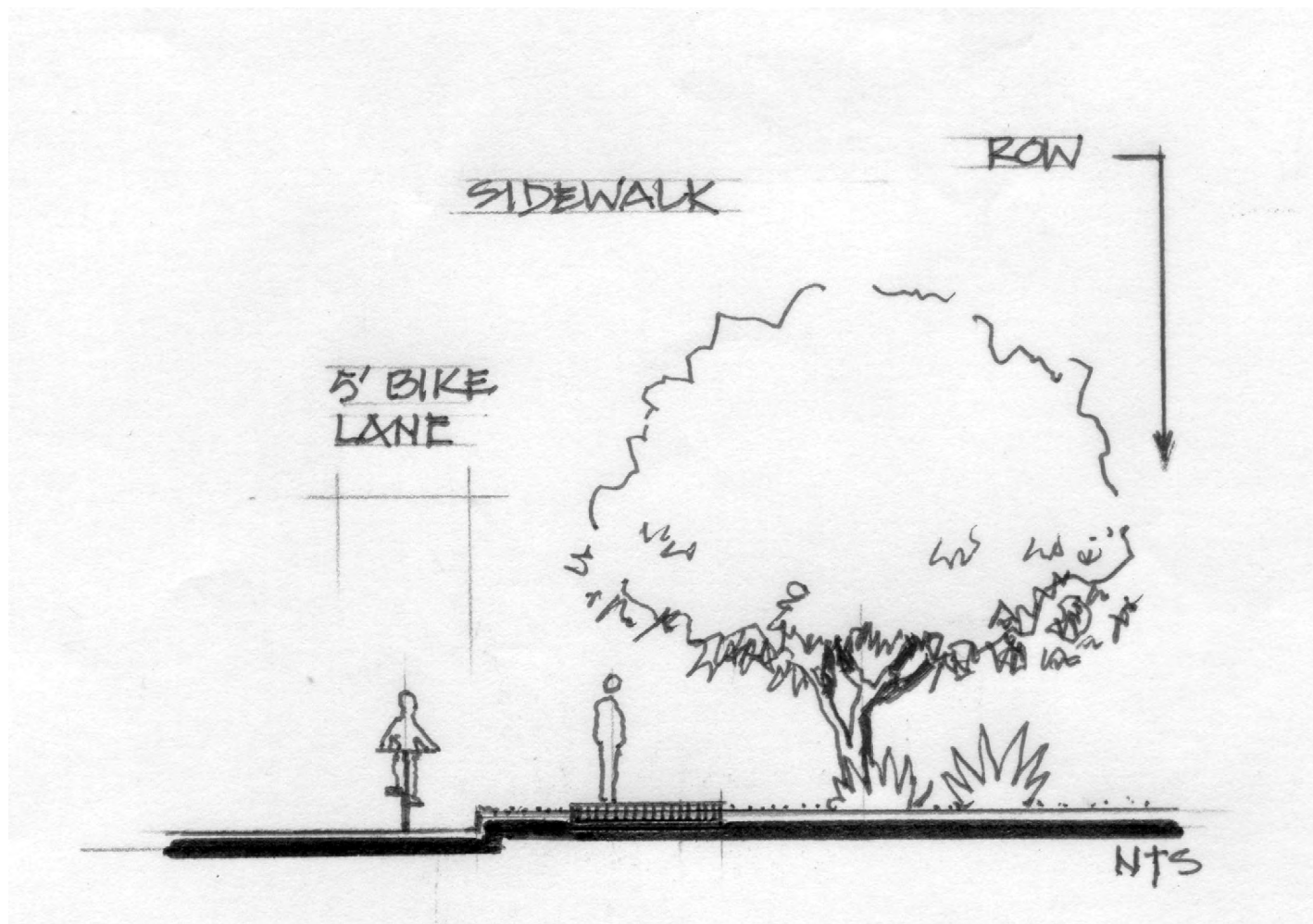


FIGURE 5.9
Alternative 2

**Typical Section Through Bike Path
and Landscape Improvements**

6.0 CONCLUSIONS AND RECOMMENDATIONS

The City of Tucson's Department of Transportation desires to complete a missing link of the current bicycle and pedestrian system. The missing section would provide a connection between the bicycle off-street path west of Kino Parkway and the bike routes east of Campbell Avenue. The intent of this project is to provide safe, aesthetically enhanced, and economically feasible bicycle and pedestrian facilities through new construction and upgrading and improving the existing level of pedestrian and bicycle services. The bicycle and pedestrian facility improvements for this project may include, but are not limited to, new asphaltic concrete (AC) pathways, new concrete curb, new concrete sidewalk, new driveway aprons, widening the existing roadway, pavement markings and signing.

The combinations of alternatives are shown in Figures 6.1 through 6.4. Combination A and 1 joins the below-grade crossing route using the concrete channel and the greenbelt (see Figure 6.1) and combination A and 2 joins the below-grade crossing and the bike route enhancement (see Figure 6.2). Combination B and 1 joins the at-grade crossing route using the existing traffic control facilities and the greenbelt (see Figure 6.3) and combination B and 2 joins the at-grade crossing route and the bike route enhancement (see Figure 6.4).

The selection of Alternatives 1 or 2 (between Campbell Avenue and Parkway Terrace) is solely dependent on the determination of available funding for right-of-way acquisition. If the needed funding were available, Alternative 1, the greenbelt, would be the most attractive choice. In terms of aesthetics, a linear river park environment is the preferable opportunity when possible. The required costs for right-of-way acquisition, though, may be too extensive of a constraint. If Alternative 2 is decided upon, the design team recommends that 15th Street and Arroyo Chico be widened to allow for bike lanes and parking on both sides of the street.

In either course of action that is determined in regards to alternatives 1 and 2, it is the recommendation of the design team that the section between Kino Parkway to Campbell Avenue of the Arroyo Chico

Greenbelt project be improved with consideration to Alternative B. There are several reasons behind the recommendation of Alternative B.

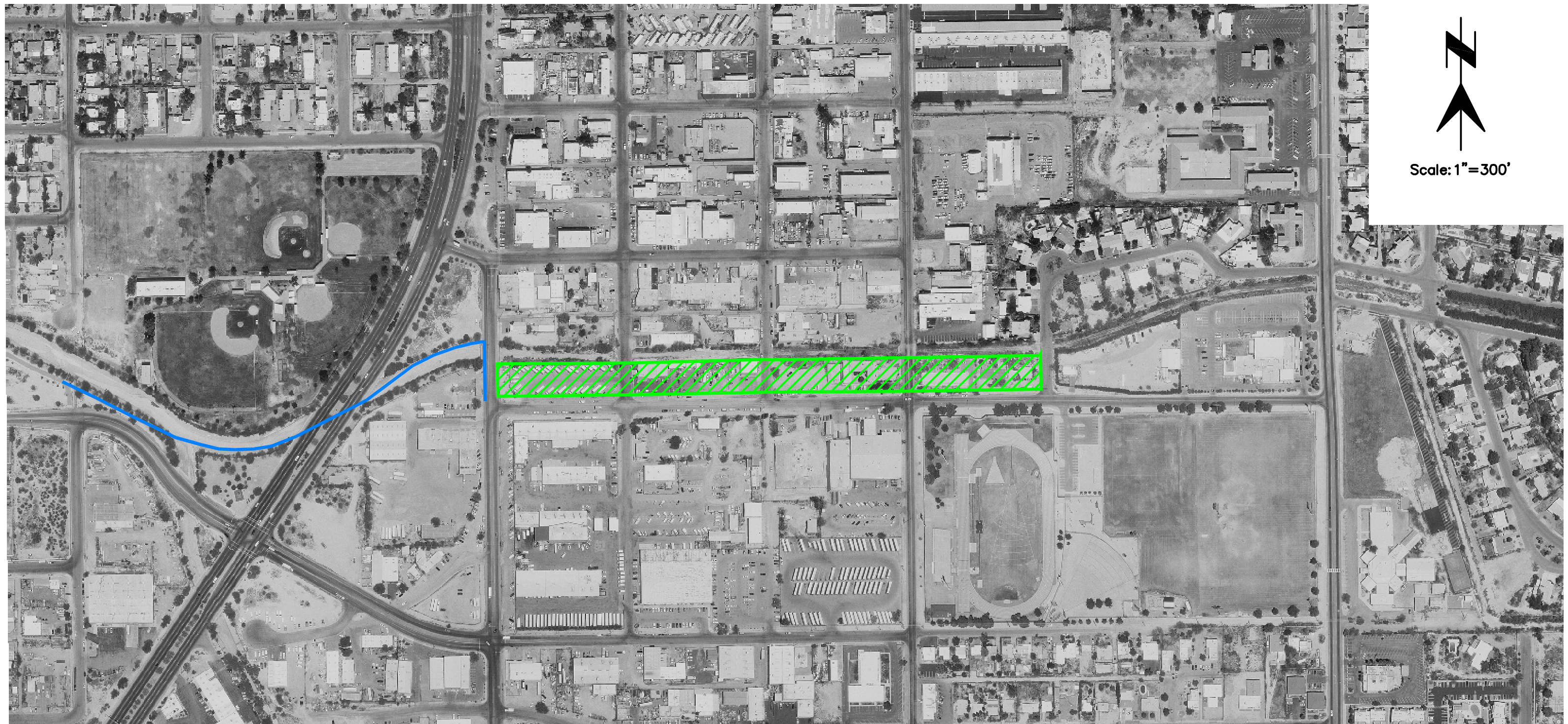
First, one project goal is to provide safe facilities. The safest location in terms of proximity to existing lighting and public visibility is at grade. Although lighting could be placed within the channel and the existing bridge culvert, visibility would still be difficult in terms of blind spots in and around the culvert walls. It seems that safety in terms of visibility would be compromised and would always be a problem under Kino Parkway whether day or night. Also, the existing signalized intersection provides a safe crossing for both bicycles and pedestrians. The location between Kino Parkway and Campbell Avenue, if maintained clear of overgrown brush and trees, would provide a safe river park bicycle and pedestrian route.

Second, the at-grade route alternative provides for aesthetically enhanced landscaping opportunities whereas the concrete lined channel would not provide for any such landscaping opportunities.

Third, it is not feasible to utilize the RCBC under Campbell Avenue as a below-grade crossing. The RCBC cannot be constructed with the required height for pedestrians and bicyclists to pass through.

Fourth, it does not seem economically feasible to construct a ramp out of the channel along the vertical walls up to Campbell Avenue.

Therefore, the overall recommendation of the design team for the Arroyo Chico Greenbelt project is that the combination of Alternative B and Alternative 1 be utilized during the design stages.

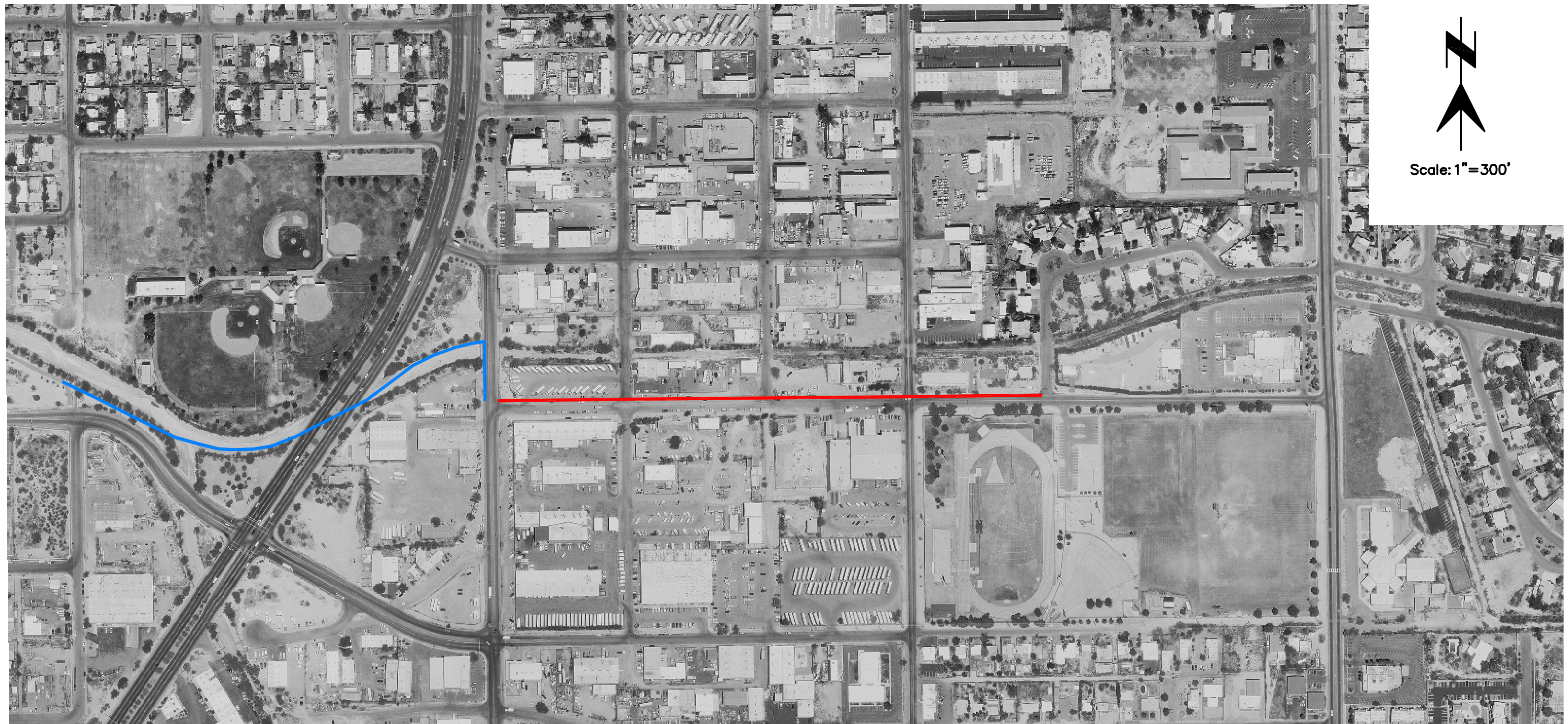


Alternative 1 - Greenbelt/Right-of-Way Take



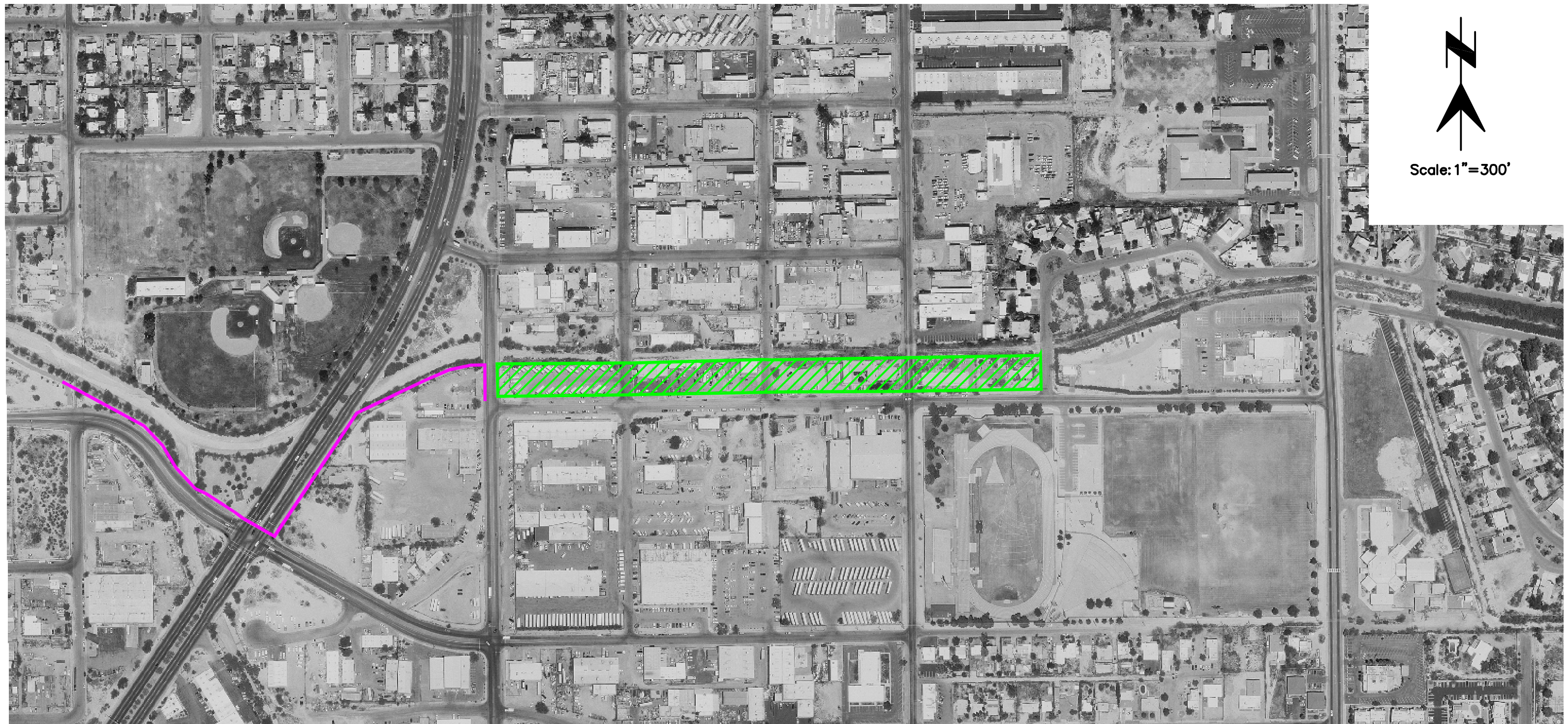
Alternative A - Bike Path Below Pmnt Grade in Concrete Channel


FIGURE 6.1
Design Alternative A1



- Alternative 2 – Bike Lane/Bike Path
- Alternative A – Bike Path Below Pymt Grade in Concrete Channel

FIGURE 6.2
Design Alternative A2



 Alternative 1 - Greenbelt/Right-of-Way Take


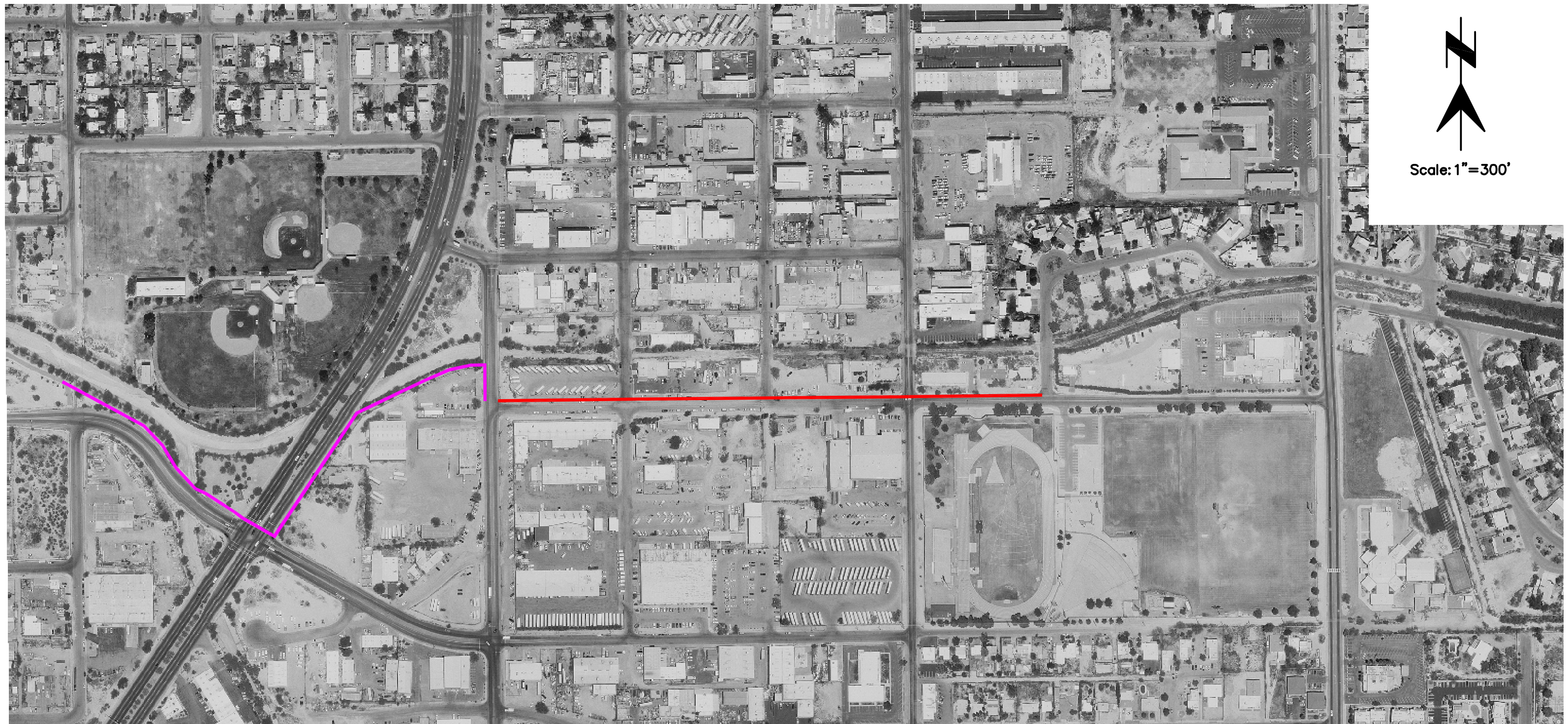
 Alternative B - Bike Path at Pvmnt Grade

FIGURE 6.3
Design Alternative B1



- Alternative 2 – Bike Lane/Bike Path
- Alternative B – Bike Path at Pwmt Grade

FIGURE 6.4
Design Alternative B2

APPENDICES

APPENDIX A

PROJECT LOCATION PHOTOS



Figure A.1

Beginning of project limits looking west along 15th Street west of Kino Parkway.



Figure A.2

Arroyo Chico Wash west of Kino Parkway, looking west to where a ramp into the concrete lined channel for Alternative A would be constructed.



Figure A.3

Arroyo Chico Wash east of Kino Parkway, looking west to Kino Parkway and bridge culvert (5-8'x8').



Figure A.4

Arroyo Chico Wash east of Kino Parkway, looking east to Campbell Avenue and RCBC (4-8'x3').



Figure A.5

Northwest corner of Kino Parkway and 15th Street intersection, looking east across Kino Parkway.



Figure A.6

East side of Kino Parkway looking east along south side of concrete lined channel.

APPENDIX B

ITEMIZED PROJECT COST ESTIMATES

Alternative B
Kino Parkway to Campbell Avenue
(At-Grade Crossing of Kino Parkway)

Table B.2

	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	CLEARING AND GRUBBING	L.SUM	1	\$2,000.00	\$2,000
2	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$5,000.00	\$5,000
3	ASPHALTIC CONCRETE	TON	315	\$50.00	\$15,750
4	SIGNING	L.SUM	1	\$10,000.00	\$10,000
5	PAVEMENT MARKING	L.SUM	1	\$4,500.00	\$4,500
6	LANDSCAPING	L.SUM	1	\$25,500.00	\$25,500
7	IRRIGATION	L.SUM	1	\$13,000.00	\$13,000
8	LANDSCAPE/IRRIGATION MAINTENANCE	MO	3	\$2,000.00	\$6,000
9	CONCRETE CURB	L.FT.	150	\$15.00	\$2,250
10	CURB ACCESS RAMP	EACH	2	\$600.00	\$1,200
11	CONCRETE SIDEWALK	SQ.FT.	3,590	\$3.00	\$10,770
12	CONCRETE BARRIER	L.FT.	125	\$85.00	\$10,625
13	CONCRETE BARRIER TRANSITION	EACH	2	\$3,500.00	\$7,000
14					
15	SUBTOTAL				\$113,595
16					
17	EROSION CONTROL		3%		\$3,408
18	MAINTENANCE AND PROTECTION OF TRAFFIC		25%		\$28,399
19	MOBILIZATION		10%		\$11,360
20	CONSTRUCTION SURVEYING AND LAYOUT		3%		\$3,408
21	CONTINGENCIES		20%		\$22,719
22					
23	TOTAL CONSTRUCTION COST				\$182,888
24					
25	RIGHT-OF-WAY ACQUISITION	S.F.	0	\$4.00	\$0
26					
27	TOTAL ALTERNATIVE COST				\$182,888

Alternative A
Kino Parkway to Campbell Avenue
(Bike Path within Arroyo Chico Wash Concrete Channel)

Table B.1

	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	CLEARING AND GRUBBING	L.SUM	1	\$2,000.00	\$2,000
2	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$2,000.00	\$2,000
3	ASPHALTIC CONCRETE	TON	110	\$50.00	\$5,500
4	SIGNING	L.SUM	1	\$10,000.00	\$10,000
5	PAVEMENT MARKING	L.SUM	1	\$4,000.00	\$4,000
6	LIGHTING (SAFETY UNDER KINO PKWY)	L.SUM	1	\$10,000.00	\$10,000
7	LANDSCAPING	L.SUM	1	\$7,500.00	\$7,500
8	IRRIGATION	L.SUM	1	\$13,000.00	\$13,000
9	LANDSCAPE/IRRIGATION MAINTENANCE	MO	3	\$1,000.00	\$3,000
10	CURB ACCESS RAMP	EACH	2	\$600.00	\$1,200
11					
12	SUBTOTAL				\$58,200
13					
14	EROSION CONTROL		3%		\$1,746
15	MAINTENANCE AND PROTECTION OF TRAFFIC		25%		\$14,550
16	MOBILIZATION		10%		\$5,820
17	CONSTRUCTION SURVEYING AND LAYOUT		3%		\$1,746
18	CONTINGENCIES		20%		\$11,640
19					
20	TOTAL CONSTRUCTION COST				\$93,702
21					
22	RIGHT-OF-WAY ACQUISITION	S.F.	0	\$4.00	\$0
23					
24	TOTAL ALTERNATIVE COST				\$93,702

Alternative 1
Campbell Avenue to Parkway Terrace
(Greenbelt Pathway)

Table B.3

	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	CLEARING AND GRUBBING	L.SUM	1	\$10,000.00	\$10,000
2	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$150,000.00	\$150,000
3	ASPHALTIC CONCRETE	TON	615	\$50.00	\$30,750
4	SIGNING	L.SUM	1	\$15,000.00	\$15,000
5	PAVEMENT MARKING	L.SUM	1	\$6,500.00	\$6,500
6	LANDSCAPING	L.SUM	1	\$90,000.00	\$90,000
7	IRRIGATION	L.SUM	1	\$16,000.00	\$16,000
8	STRUCTURES AND FURNITURE	L.SUM	1	\$60,000.00	\$60,000
9	LANDSCAPE/IRRIGATION MAINTENANCE	MO	3	\$3,000.00	\$9,000
10	CONCRETE CURB	L.FT.	1,375	\$15.00	\$20,625
11	CURB ACCESS RAMP	EACH	8	\$600.00	\$4,800
12					
13	SUBTOTAL				\$412,675
14					
15	EROSION CONTROL		3%		\$12,380
16	MAINTENANCE AND PROTECTION OF TRAFFIC		25%		\$103,169
17	MOBILIZATION		10%		\$41,268
18	CONSTRUCTION SURVEYING AND LAYOUT		3%		\$12,380
19	CONTENGENCIES		20%		\$82,535
20					
21	TOTAL CONSTRUCTION COST				\$664,407
22					
23	RIGHT-OF-WAY ACQUISITION	S.F.	149,560	\$15.00	\$2,243,400
24					
25	TOTAL ALTERNATIVE COST				\$2,907,807

Alternative 2
Campbell Avenue to Parkway Terrace
(Bike Route Enhancement)

Table B.4

	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	CLEARING AND GRUBBING	L.SUM	1	\$1,000.00	\$1,000
2	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.SUM	1	\$25,000.00	\$25,000
3	AGGREGATE BASE	CU.YD.	210	\$40.00	\$8,400
4	ASPHALTIC CONCRETE	TON	302	\$50.00	\$15,100
5	SIGNING	L.SUM	1	\$10,000.00	\$10,000
6	PAVEMENT MARKING	L.SUM	1	\$7,000.00	\$7,000
7	LANDSCAPING	L.SUM	1	\$39,000.00	\$39,000
8	IRRIGATION	L.SUM	1	\$11,000.00	\$11,000
9	LANDSCAPE/IRRIGATION MAINTENANCE	MO	3	\$1,000.00	\$3,000
10	CONCRETE CURB	L.FT.	2,900	\$15.00	\$43,500
11	CURB ACCESS RAMP	EACH	13	\$600.00	\$7,800
12	CONCRETE SIDEWALK	SQ.FT.	14,500	\$3.00	\$43,500
13	CONCRETE DRIVEWAY	SQ.FT.	4,800	\$4.00	\$19,200
14					
15	SUBTOTAL				\$233,500
16					
17	EROSION CONTROL		3%		\$7,005
18	MAINTENANCE AND PROTECTION OF TRAFFIC		25%		\$58,375
19	MOBILIZATION		10%		\$23,350
20	CONSTRUCTION SURVEYING AND LAYOUT		3%		\$7,005
21	CONTENGENCIES		20%		\$46,700
22					
23	TOTAL CONSTRUCTION COST				\$375,935
24					
25	RIGHT-OF-WAY ACQUISITION	S.F.	0	\$4.00	\$0
26					
27	TOTAL ALTERNATIVE COST				\$375,935